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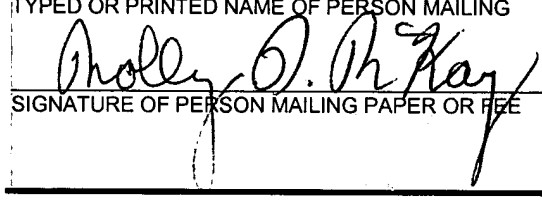

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UNITED STATES PATENT APPLICATION

FOR

SYSTEM FOR INSTALLING SUSPENDED CEILING

SYSTEM FOR INSTALLING SUSPENDED CEILING

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a system for installing suspended ceiling in large commercial buildings that have spans of hundreds of feet between their outside walls. Current support systems for suspending insulating ceiling tiles are not strong enough to suspend ceilings in these types of large buildings. The present invention makes installation of suspended ceilings possible.

2. Description of the Related Art

Large commercial buildings of the type spanning hundreds of feet are generally constructed of metal. These large buildings generally do not have a ceiling but instead the interior of the building extends to the metal that forms the roof of the building. Generally metal purlins support the roof of this type of building. Because of the large space overhead, these buildings are hard to light and hard to heat and cool. Also, the acoustics in these types of buildings make them noisy places where it is hard to communicate. Installation of a suspended ceiling in these large commercial buildings could reduce operational costs and make the building a more pleasant work environment. However, the support

systems currently available for suspending ceilings are not strong enough to span the long lengths and widths required for these types of commercial buildings. Currently available systems for installing suspended ceilings are designed for much smaller installations.

The present invention addresses this problem by providing a system for installing suspended ceilings in large commercial buildings. The present system employs ceiling supports that are t-shaped ceiling joists. These t-shaped joists are employed for both the main joists and for the intersecting branch joists.

The joists are suspended from the purlins of the building by upper brackets that secure to the purlins and by lower brackets that secure to the joists. Rods that are adjustable in length attach the upper brackets to the lower brackets, and thereby, suspend the joists below the purlins. When the joists are installed, the rods are adjusted in length so that all the joists are level and are suspended at the desired height within the building.

The main joists are preferably spaced approximately 8 feet apart from each other, and the branch joists are preferably spaced approximately 4 feet apart from each. The branch joists are located at right angles to the main joists so that together the main and intersecting branch joists form a plurality of frames to support 4 x 8 foot sheets of insulated ceiling board. Together the joists and the ceiling boards form the suspended ceiling for the building.

SUMMARY OF THE INVENTION

The present invention is a system for installing suspended ceilings in large commercial buildings. The present system employs ceiling supports that are t-shaped ceiling joists for both the main joists and for the intersecting branch joists.

The joists are suspended from the purlins of the building by upper brackets that secure to the purlins and by lower brackets that secure to the joists. Rods that are adjustable in length attach the upper brackets to the lower brackets to thereby suspend the joists below the purlins. When the joists are installed, the rods are adjusted in length so that all the joists are level and are suspended at the desired height within the building.

The main joists are preferably spaced approximately 8 feet apart from each other, and the branch joists are preferably spaced approximately 4 feet apart from each and at right angles to the main joists so that together the main and intersecting branch joists form a plurality of frames. Each frame supports a 4 x 8 foot sheet of insulated ceiling board. Together the joists and the ceiling boards form the suspended ceiling for the building.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a perspective view of a suspended ceiling system constructed in accordance with a preferred embodiment of the present invention, shown installed to the purlins of a building.

FIGURE 2 is an enlarged view of the portion of Figure 1 enclosed within circle number 2 showing the details of the suspended ceiling system.

FIGURE 3 is a cross sectional view of a main joist taken along line 3-3 of Figure 2, shown with the lower attachment bracket removed.

FIGURE 4 is a cross sectional view of a branch joist taken along line 4-4 of Figure 2.

FIGURE 5 is a side view of a lower bracket taken along line 5-5 of Figure 2.

FIGURE 6 is a front view of a lower bracket taken along line 6-6 of Figure 5.

FIGURE 7 is a side view of an upper bracket taken along line 7-7 of Figure 2.

FIGURE 8 is a front view of an upper bracket taken along line 8-8 for Figure 7.

FIGURE 9 is a side view of a 96 inch long main joist component employed in the system of Figure 1.

FIGURE 10 is a cross sectional view of the 96 inch main joist component taken along line 10-10 of Figure 9.

FIGURE 11 is a top plan view of the 96 inch main joist component taken along line 11-11 of Figure 9.

FIGURE 12 is a side view of a 48 inch long main joist component employed in the system of Figure 1.

FIGURE 13 is a cross sectional view of the 48 inch main joist component taken along line 13-13 of Figure 12.

FIGURE 14 is a top plan view of the 48 inch main joist component taken along line 14-14 of Figure 12.

FIGURE 15 is a side view of a branch joist component employed in the system of Figure 1.

FIGURE 16 is a cross sectional view of the branch joist component taken along line 16-16 of Figure 15.

FIGURE 17 is a top plan view of the branch joist component taken along line 17-17 of Figure 15.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

THE INVENTION

Referring now to the drawings and initially to Figure 1, there is illustrated a system for installing suspended ceilings **10** in large commercial buildings constructed in accordance with a preferred embodiment of the present invention. The present system **10** employs two types of ceiling supports or ceiling joists: t-shaped main joists **12** and t-shaped branch joists **14**. The main joists **12** span the width of the building and the branch joists **14** extend between adjacent main joists **12** to intersect the main joists **12** at right angles, thereby forming oblong frames **16** for supporting ceiling panels **18**.

Each main joist **12** is constructed of a series of j-shaped main subcomponents **20** and **22** that are secured together along their back sides, **24** and **26** to form the t-shaped joists, as will be more fully described hereafter. Also, each branch joist **14** is constructed of two identical j-shaped branch subcomponents **28** that are secured together along their back sides **29**. Each of the branch subcomponents **28** is approximately 8 foot long. The main subcomponents **20** and **22** are secured together with nuts **30** and bolts **32** that insert through bolt openings **34** provided in the subcomponents **20** and **22**.

Likewise each branch subcomponents **28** is secured together with nuts **30B** and bolts **32B** that insert through bolt openings **36** provided in the branch subcomponents **28**. Each j-shaped branch subcomponent **28** is approximately 8

feet long. When two branch subcomponents **28** secured together to form a branch joist **14**, both ends **38** of the pair are flush with one another.

As illustrated in Figure 15-17, each end **38** of the branch subcomponents **28** is provided with an end notch **40**. Also, each branch subcomponent **28** is provided with a bottom notch **42** that extends up into the main portion **44** of the subcomponent **28** and extends completely through a long leg **46** of the j-shaped branch subcomponent **28** and completely through an upwardly extending lip **48** provided on the long leg **46**. When the branch subcomponents **28** are secured together to form the branch joists **14**, end notches **40** of the pairs of branch subcomponents **28** coincide or align with each other to form a single combined end notch **40C** at both combined ends **38C** of the branch subcomponents **28**.

The bottom notches **42** in the branch subcomponents **28** also align linearly with each other when the branch joists **14** are created, thereby formed a branch joist **14** with a combined bottom notch **42C** that is linearly aligned and extends through a combined main portion **40C** of the branch joist **14**, through the long legs **46**, and through both upwardly extending lips **48**.

As illustrated in Figures 3 and 4, the combined end notches **40C** on the branch joists **14** are provided to allow the branch joists **14** to be positioned perpendicular to the main joists **12**. In thus positioning the branch joists **14**, the combined end notches **40C** are needed to allow the combined ends **38C** of the branch joists **14** to be pushed past bolts **32** that secure together the main subcomponents **20** and **22** that form the main joists **12**. And also when the

branch joists **14** are attached to the main joists **12**, the aligned combined bottom notches **42C** of the branch joists **14** receive upturned lips **50** and **52** provided respectively on the main subcomponents **20** and **22** of the main joists **12**.

Referring now to Figures 1 and 2, each main joist **12** is constructed of j-shaped main subcomponents **20** and **22** that are staggered so that the joints **54** between abutting ends, **56** and **58** respectively for main subcomponents **20** and **22**, of the main subcomponents **20** and **22** on a first side **60** of the main joist do not coincide with the joints **54** on the opposite second side **62** of the main joist **12**. This staggered arrangement of joints **54** in construction of the main joists **12** results in added strength. In order to stagger these joints **54**, construction of a main joist **12** requires two different lengths of main subcomponents **20** and **22**. The first type of main subcomponent **20** is approximately 48 inches long, as illustrated in Figures 12-14, and the second type of main subcomponent **22** is approximately 96 inches long, as illustrated in Figures 9-11.

Construction of a main joist **12** begins by employing a 48 inch main subcomponent **20** on the first side **60** of the main joist **12** in conjunction with a 96 inch length main subcomponent **22** on the other side **62** of the main joist **12** so that these two main subcomponents **20** and **22** are flush with each other on one end, i.e. the beginning end **64**, but are staggered on their opposite ends, **56** and **58** respectively. These first two main subcomponents **20** and **22** are secured together with nuts **30** and bolts **32** that insert through bolt openings **36** provided in the main subcomponents **20** and **22**. Then, the main joist **12** is lengthened to

the desired length, i.e. the width of the building. This is done by securing additional 96 inch length main subcomponents **22** at ends **56** and **58** of the main joist **12** and continuing to add subcomponents **22** thereafter at the ends **58** of the previous subcomponent **22** on each side **60** and **62** of the main joist **12** until the main joist **12** spans the width of the building. This results in main joists **12** with perfectly staggered joints **54**. Additional main joists **12** are constructed until the entire area where the suspended ceiling **10** is being installed is provided with main joists **12** that are spaced approximately 8 feet apart from each other. As illustrated in Figure 1, a series of branch subcomponents **28** are secured between adjacent beginning ends **64** of the main joists **12** and between adjacent opposite ends (not illustrated) of the main joists **12** to form frames **16** at the sides **66** of the ceiling **10** where the main joists **12** intersect with the walls of the building.

Referring now to Figure 2, the main joists **12** are slightly taller than the branch joists **14** so that the two types of joists **12** and **14** secure together properly where the branch joists **14** intersect with the main joists **12**. The branch joists **14** are secured to the main joists **12** with nuts **30C** and bolts **32C** that insert through bolt openings **68** and **70** provided respectively in the main and branch joists **12** and **14** for this purpose. As shown on Figures 15-17, additional bolt openings **70** are provided along the length of the branch subcomponents **28** for use if the branch joists **14** need to be shortened, such as for example at the sides **66** of the ceiling **10**.

Referring now to Figures 1, 2 and 5-8, the main joists **12** are suspended from the purlins **72** or rafters of the building by upper brackets **74** that secure to the purlins **72** and by lower brackets **76** that secure to the main joists **12**. Rods **78** that are adjustable in length attach the upper brackets **74** to the lower brackets **76** to thereby suspend the main joists **12** below the purlins **72**. Later when the branch joists **14** are attached to the main joists **12** and when the ceiling panels **18** are supported by the frames **16** formed by the joists **12** and **14**, the rods **78** and brackets **74** and **76** support the entire suspended ceiling **10**, including joists **12** and **14** and the ceiling panels **18**.

Each rod **78** is threaded at least on its ends. When the main joists **12** are installed, each rod **78** is adjusted in length by either rotating the threaded rod **78** relative to one or both brackets **74** and **76** or rotating one or both of the brackets **74** and **76** relative to the threaded rod **78**. Each bracket **74** and **76** has a female threaded rod receiving opening, **80** and **82** respectively, provided therein for engagement by its associated threaded rod **78** to allow the effective length **84** of the rod **78** to be either shortened or lengthened, as the situation may require. As illustrated in Figure 2, the effective length **84** of the rod **78** is measured between the upper bracket **74** and its associated lower bracket **76**. Rotation of the rod **78** relative to one or both of the upper and lower brackets **74** and **76** moves the brackets either closer together or further apart, thereby either effectively shortening or lengthening the rod **78**, which in turn results in either raising or lowering the main joists **12** within the building.

This procedure is used to adjust the rods **78** so that all the main joists **12** in the building are level and are suspended at the desired height. As best illustrated in Figure 5, each of the lower brackets **76** preferably attaches to one of the main joists **12** via a nut **86** and bolt **88**, with the bolt **88** inserting through bolt openings **90** and **92**. Bolt openings **90** are provided in the lower bracket **76**. Bolt openings **92** are provided in the main subcomponents **20** and **22** and in the main joist **12**. Bolt openings **92** are also provided in the branch subcomponent **28** and the branch joists **14** in the event that it is desirable to support the branch joists **14** from the purlins **72** via additional brackets **74** and **76** and rods **78**. Each of the upper brackets **74** preferably attaches to a purlin **72** of the building via a clamp **94** that is attached to the upper bracket **74**. The clamp **94** is the preferably used for ease of installation, however, other means of attaching the upper brackets **74** to the purlins **72** may be employed, such as for example, nuts and bolts or other suitable means.

The main joists **12** are preferably spaced approximately 8 feet apart from each other, and the branch joists **14** are preferably spaced approximately 4 feet apart from each and at approximately right angles to the main joists **12** so that together the main and intersecting branch joists **12** and **14** form a plurality of frames **16**. Each frame **16** supports a 4 x 8 foot sheet of insulated ceiling board or ceiling panel **18**. Together the joists **12** and **14**, the brackets **74** and **76** and rods **78** that support the joists **12** and **14**, and the ceiling panels **18** form the suspended ceiling **10** for the building.

Although the invention has been described as employing nuts and bolts to fasten it together, the invention is not so limited. Any suitable fastening device, such as for example metal screws, may be employed in place of the nuts and bolts described above for this invention.

While the invention has been described with a certain degree of particularity, it is manifest that many changes may be made in the details of construction and the arrangement of components without departing from the spirit and scope of this disclosure. It is understood that the invention is not limited to the embodiments set forth herein for the purposes of exemplification, but is to be limited only by the scope of the attached claim or claims, including the full range of equivalency to which each element thereof is entitled.